Hexachlorobenzene

Chemical Information
Hexachlorobenzene (HCB) is a white crystalline solid created by the chlorination of benzene. A number of manufacturing processes for chlorinated organic compounds generate HCB as a byproduct or impurity. During the manufacture of chlorinated organic chemicals, HCB may be formed by thermal chlorination, oxychlorination, and pyrolysis when carbon and chlorine react at high temperatures. HCB is usually found in the still bottoms generated during product purification or distillation and in air emissions from distillation columns. HCB may also be found as an impurity in commercial chlorinated solvent products.
CAS Number - 118-74-1
Alternate Names - pentachlorophenyl chloride, perchlorobenzene
General Uses - HCB is also a potential byproduct formed during the production of metallic magnesium when produced via electrolysis with carbon electrodes. The degassing of molten aluminum with hexachloroethylene at aluminum foundries and secondary aluminum smelting plants also produces HCB. Gaseous emissions from hexachloroethylene-based aluminum degassing contain high yields of complex organochlorine compounds, including HCB. Hexachlorobenzene was once used as an agricultural fungicide, but health concerns about its toxicity led to the cancellation of the registrations of all pesticides that contained hexachlorobenzene as an active ingredient. Its primary use was to treat wheat seeds, onions, and sorghum. As late as 1985 it was used to prevent wheat smut. Although no longer used as an active ingredient in pesticides, hexachlorobenzene is a byproduct impurity contained in a number of pesticides. However, using and intentionally making hexachlorobenzene is no longer allowed in the United States.
Potential Hazards - This compound is an irritant of the skin, eyes, mucous membranes and upper respiratory tract. It emits toxic fumes of chlorides, carbon monoxide and carbon dioxide when heated to decomposition. Potentially toxic to the liver and a probable human carcinogen (EPA Integrated Risk Information System –IRIS).

Summary Analysis– Hexachlorobenzene

- In 2003, the 4,272,727 pounds of hexachlorobenzene accounted for about 5.4 percent of the total quantity of PCs. Since 1999, there was a 20.9 percent decrease in the quantity of hexachlorobenzene.
- The number of facilities that reported hexachlorobenzene more than tripled between 1999 and 2000, but have remained relatively constant the last few years, with 38 facilities reporting this chemical in 2003. Four facilities accounted for over 98 percent of the total quantity.
- Since 1999, treatment was used to manage over 90 percent of the total quantity of hexachlorobenzene. In 2003, energy recovery was used for about 7 percent of the total quantity; land disposal was used for less than 1 percent. Recycling of hexachlorobenzene has increased significantly since 1999, although there was a decline in 2003, compared to the five-year high quantity of 740,144 pounds in 2002.
- Since 1999, Region 6 facilities have accounted for at least 97 percent of the total quantity of hexachlorobenzene. In 2003, facilities in Louisiana accounted for over 81 percent of the total quantity and Texas facilities accounted for over 18 percent.

- Facilities in 3 industry sectors accounted for over 99 percent of this chemical in 2003: SIC 2869 (Industrial organic chemicals, nec), SIC 2812 (Alkalies and chlorine), and SIC 2821 (Plastics materials and resins).

National Trends – Hexachlorobenzene. Exhibit 4.99 presents the total PC quantity (pounds) of hexachlorobenzene in 1999 to 2003, showing the disposal, treatment, energy recovery, as well as recycling quantities. In 2003, the 4,272,727 pounds of hexachlorobenzene accounted for about 5.4 percent of the total quantity of PCs. Since 1999, there was a 20.9 percent decrease in the quantity of hexachlorobenzene. The number of facilities that reported hexachlorobenzene more than tripled between 1999 and 2000, but have remained relatively constant the last few years, with 38 facilities reporting this chemical in 2003.

Since 1999, treatment has been the primary management method -- used to manage over 90 percent of the total quantity of hexachlorobenzene. In 2003, energy recovery was used for about 7 percent of the total quantity; land disposal was used for less than 1 percent. Recycling of hexachlorobenzene has increased significantly since 1999, although there was a decline in 2003, compared to the five-year high quantity of 740,144 pounds in 2002.

Exhibit 4. 99. National-Level Information for Hexachlorobenzene

	1999	2000	2001	2002	2003	Percent Change (1999 - 2003)	Management Method -- Percent of Quantity of this Chemical in 2003
Number of Facilities	12	44	41	37	38	216.7%	
Disposal Quantity (lbs.)	13,573	13,025	13,992	6,247	14,412	6.2%	0.3%
Energy Recovery Quantity (lbs.)	138,945	167,085	350,900	201,616	301,990	117.3%	7.1%
Treatment Quantity (lbs.)	5,249,188	5,754,663	5,400,970	4,001,015	3,956,326	-24.6%	92.6%
Priority Chemical Quantity (lbs.)	5,401,706	5,934,773	5,765,862	4,208,878	4,272,727	-20.9%	
Recycling Quantity (lbs.)	32,854	17,139	6,310	740,144	399,607	1116.3%	

Exhibit 4.100 shows the number of facilities that reported hexachlorobenzene within various quantity ranges. Of the 38 facilities that reported hexachlorobenzene in 2003, 4 facilities accounted for over 98 percent of the total quantity of this chemical. One facility reported over 60 percent of the total quantity.

Exhibit 4. 100. Distribution of Facilities that Reported Quantities for Hexachlorobenzene (2003)

Hexachlorobenzene (4,272,727 pounds)		
Quantity Reported	**Number of Facilities Reporting this quantity**	**Percent of Total Quantity for this PC**
up to 10 pounds	10	less than 0.1%
between 11 - 100 pounds	9	less than 0.1%
between 101 -1,000 pounds	4	less than 0.1%
between 1,001 - 10,000 pounds	9	0.8%
between 10,001 - 100,000 pounds	2	0.9%
between 100,001 - 1 million pounds	3	38.1%
> 1 million pounds	1	60.2%

EPA Region Trends- Hexachlorobenzene. Exhibit 4.101 shows the quantity (pounds) of hexachlorobenzene for those EPA Regions where facilities reported those PCs in 1999-2003 (see also Exhibit 4.102). In 1999, facilities in only 3 of the 10 EPA Regions reported hexachlorobenzene; in 2003, facilities in 8 of the Regions reported hexachlorobenzene. However, over 99.5 percent of the total quantity was reported by facilities in Region 6. Since 1999, Region 6 facilities have accounted for at least 97 percent of the total quantity of hexachlorobenzene.

Exhibit 4. 101. Quantity of Hexachlorobenzene Reported by EPA Regions (1999-2003)

EPA Region	1999	2000	2001	2002	2003	Percent Change in Quantity (1999-2003)	Percent Of the Total Priority Chemical quantity (2003)
1	0	6	0	0	0	NA	0.0%
2	0	3,233	2,966	3,146	3,492	NA	0.1%
3	0	0	19	0	83	NA	0.0%
4	23,072	120,556	5,981	1,926	11,642	-49.5%	0.3%
5	0	54	35	49	157	NA	0.0%
6	5,335,049	5,752,014	5,751,600	4,198,285	4,252,854	-20.3%	99.5%
7	0	31	78	53	29	NA	0.0%
8	0	213	623	360	46	NA	0.0%
9	43,585	58,665	4,560	5,059	4,424	-89.8%	0.1%
Total	5,401,706	5,934,773	5,765,862	4,208,878	4,272,727	-20.9%	

Exhibit 4. 102. Distribution of Facilities Reporting Hexachlorobenzene in 2003 & Quantity of Dibenzofuran Reported in 2003 per Region

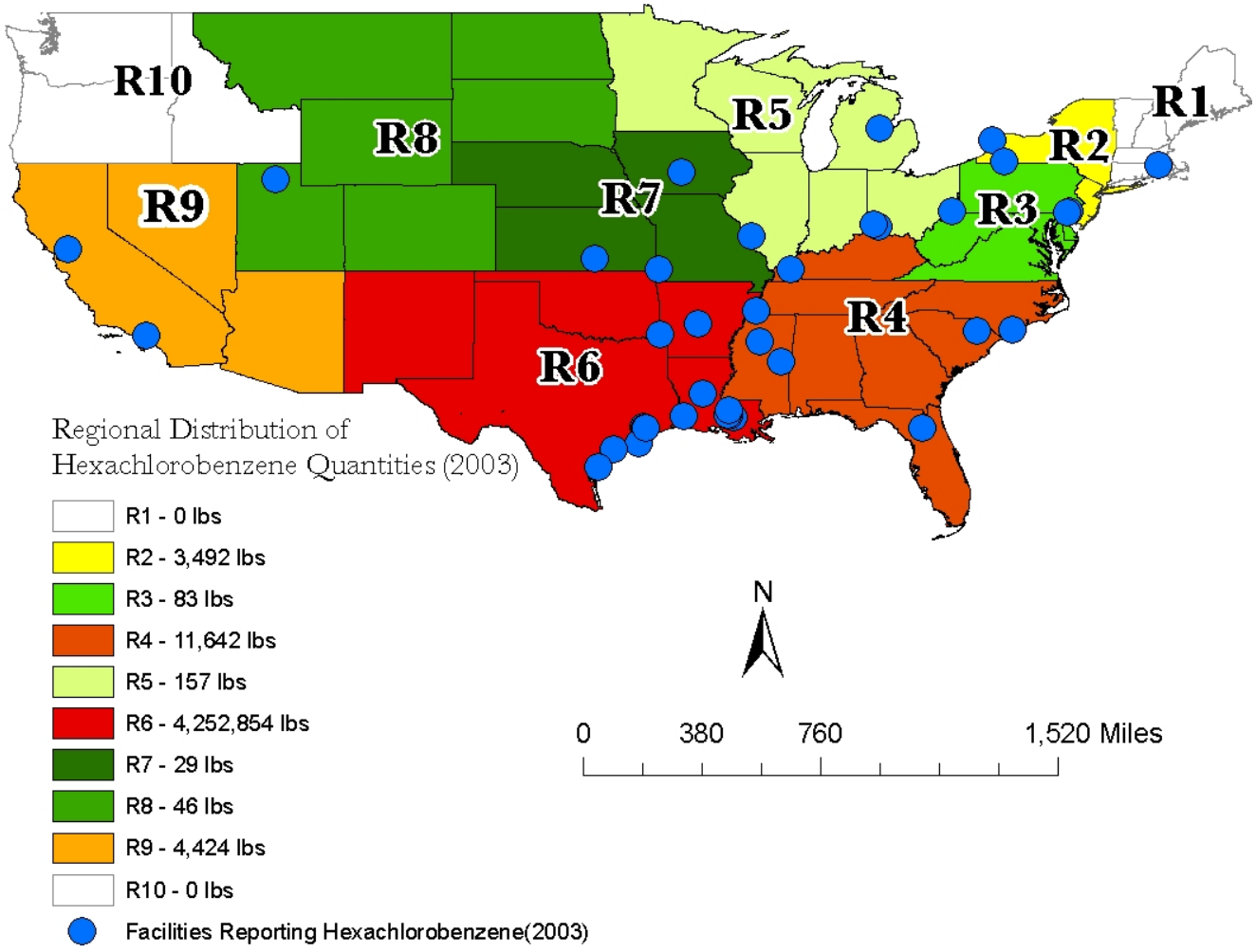

Exhibit 4.103 shows how hexachlorobenzene was managed by the facilities in each of the 8 EPA Regions that reported this chemical in 2003. In 2003, almost 93 percent of the PC quantity of hexachlorobenzene was treated, mostly onsite -- at facilities in Region 6. About 7 percent of the hexachlorobenzene also was managed via onsite energy recovery, primarily by facilities in Region 6. For the most part, non-Region 6 facilities used a combination of land disposal (primarily offsite) and treatment to manage their hexachlorobenzene. Facilities in Region 9 used energy recovery for about 50 percent of their quantity of hexachlorobenzene. A notable quantity of hexachlorobenzene was recycled (onsite) by Region 6 and Region 9 facilities.

Exhibit 4. 103. Management Methods for Hexachlorobenzene, By EPA Region (2003)

EPA Region	Disposal		Energy Recovery		Treatment		Recycling	
	Onsite Disposal	Offsite Disposal	Onsite Energy Recovery	Offsite Energy Recovery	Onsite Treatment	Offsite Treatment	Onsite Recycling	Offsite Recycling
2	11	53	0	0	757	2,672	0	0
3	0	0	0	0	0	83	0	0
4	0	4,100	0	0	5,169	2,373	0	0
5	2	2	0	0	102	51	0	0
6	488	9,742	299,751	1	3,915,822	27,050	393,716	0
7	6	0	0	0	0	23	0	0
8	8	0	0	0	0	38	0	0
9	0	0	0	2,237	1,998	188	5,891	0

State Trends- Hexachlorobenzene. In 2003, although facilities in 17 states reported a PC quantity of hexachlorobenzene, only 2 of these states (Louisiana and Texas) accounted for over 99 percent of the total PC quantity of hexachlorobenzene. Exhibit 4.104 shows the quantity of hexachlorobenzene, between 1999 and 2003, that was reported by facilities in these 2 states in 2003. Facilities in Louisiana accounted for over 81 percent of the total quantity of this chemical in 2003. Texas facilities accounted for over 18 percent. Since 1999, the Louisiana facilities increased their quantity of hexachlorobenzene by almost 27 percent, with most of the increase occurring in 2003. The quantity of hexachlorobenzene has decreased more than 70 percent at Texas facilities since 1999, with significant decreases occurring in both 2002 and 2003.

Exhibit 4. 104. State-Level Information for Facilities Reporting Hexachloro-1,3-butadiene (1999-2003)

State	1999	2000	2001	2002	2003	Change in Quantity (1999-2003)	Percent of Total Quantity of this Priority Chemical (2003)
AR	0	12	480	173	1,950	1,950	0%
CA	43,585	58,665	4,560	5,059	4,424	-39,161	0%
CO	0	0	190	30	0	0	0%
CT	0	6	0	0	0	0	0%
FL	0	2,565	2,816	160	53	53	0%
GA	0	2	0	0	0	0	0%
IA	0	1	0	2	1	1	0%
IL	0	22	23	27	23	23	0%
KS	0	30	78	51	28	28	0%
KY	1,650	8	0	0	8,600	6,950	0%
LA	2,747,121	3,001,834	3,180,684	2,445,788	3,478,280	731,159	81%
MI	0	18	1	21	104	104	0%
MN	0	12	0	0	0	0	0%
MS	0	0	0	1	1	1	0%

State	1999	2000	2001	2002	2003	Change in Quantity (1999-2003)	Percent of Total Quantity of this Priority Chemical (2003)
NJ	0	2,985	2,761	2,760	3,325	3,325	0%
NY	0	248	205	387	168	168	0%
OH	0	1	11	1	30	30	0%
SC	0	0	1	0	0	0	0%
TN	21,422	117,980	3,163	1,765	2,988	-18,434	0%
TX	2,587,928	2,750,168	2,570,436	1,752,324	772,624	-1,815,304	18%
UT	0	213	433	330	46	46	0%
WV	0	0	19	0	83	83	0%
Total	5,401,706	5,934,773	5,765,862	4,208,878	4,272,727	-1,128,979	100%

Exhibit 4. 105. State-Level Information for Facilities Reporting over 99 Percent of Hexachlorobenzene (1999-2003)

State	1999	2000	2001	2002	2003	Change in Quantity (1999-2003)	Percent Change in Quantity (1999-2003)	Percent of Total Quantity of this Priority Chemical (2003)
Louisiana	2,747,121	3,001,834	3,180,684	2,445,788	3,478,280	731,159	26.6%	81.4%
Texas	2,587,928	2,750,168	2,570,436	1,752,324	772,624	-1,815,304	-70.1%	18.1%

Exhibit 4. 106. Trends Analysis on States with Largest Quantity Increase and Decrease (1999 – 2003): Facilities in Louisiana and Texas

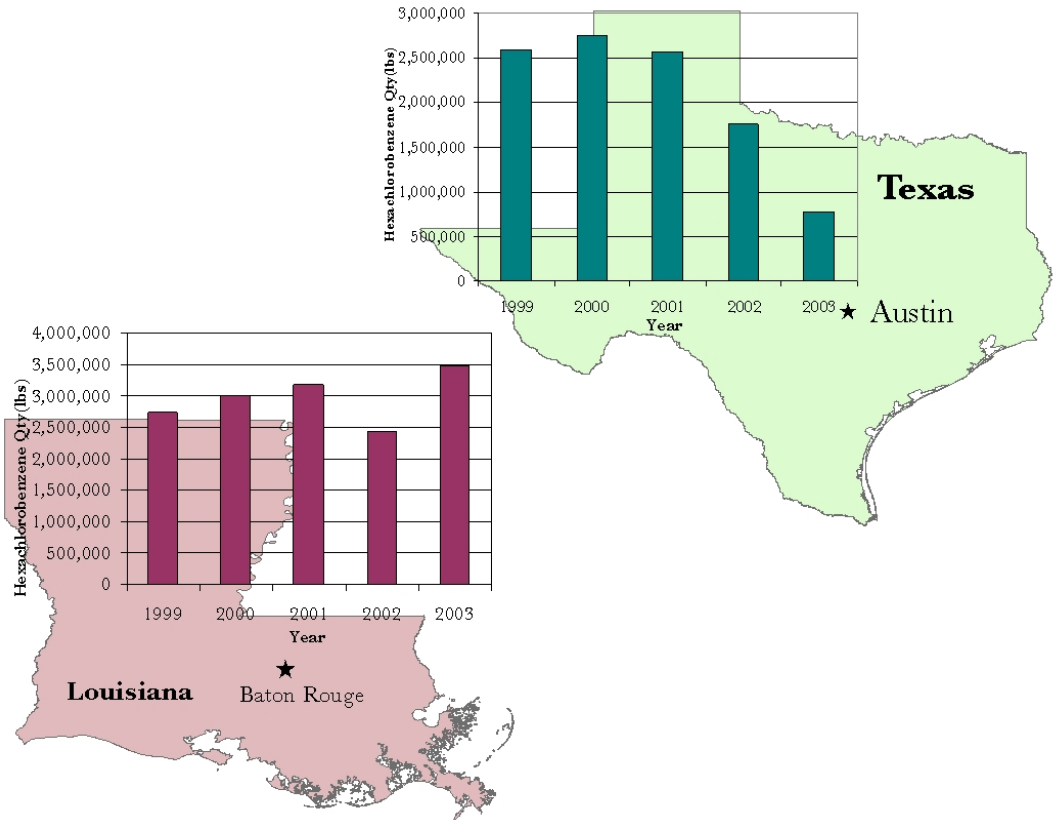

Exhibit 4.107 shows how hexachlorobenzene was managed by facilities in Louisiana and Texas in 2003. Most (over 92%) of the hexachlorobenzene reported by facilities in Louisiana and Texas was treated onsite (Exhibit 4.106). A notable quantity of hexachlorobenzene was recycled by Texas facilities; no recycling was reported by the Louisiana facilities in 2003.

Exhibit 4. 107. Management of hexachlorobenzene in States with over 99 Percent of Total Quantity (2003)

State	Total Priority Chemical Quantity (2003)	Onsite Disposal	Offsite Disposal	Onsite Energy Recovery	Offsite Energy Recovery	Onsite Treatment	Offsite Treatment	Onsite Recycling	Offsite Recycling
Louisiana	3,478,280	33	17	299,735	1	3,178,218	274	0	0
Texas	772,624	454	9,725	16	0	737,604	24,825	393,716	0

Industry Sector (SIC) Trends- Hexachlorobenzene. Exhibit 4.108 shows the PC quantity (pounds) of hexachlorobenzene for the 3 industry sectors (SIC codes) where facilities reported over 99 percent of this chemical in 2003. Facilities in SIC 2869 (Industrial organic chemicals, nec) reported the highest quantities, accounting for over 61 percent of the total PC quantity of hexachlorobenzene in 2003. Since 1999, the quantity of hexachlorobenzene reported by SIC 2869 facilities has increased significantly, particularly in 2002 and again in 2003. Compared to quantities reported in 1999 through 2002, a very large increase in the quantity of hexachlorobenzene also occurred in 2003 for facilities in SIC 2821 (Plastics materials and resins). Facilities in SIC 2812 (Alkalies and chlorine), although accounting for over 21 percent of the total quantity of hexachlorobenzene in 2003, reported decreased quantities in 2002 and in 2003.

Exhibit 4. 108. Industry Sector-Level Information for Hexachlorobenzene (1999-2003)

Primary SIC Code	SIC Description	Number of Facilities for this SIC Code (2003)	1999	2000	2001	2002	2003	Change in Quantity (1999-2003)	Percent of Total Quantity of this Priority Chemical (2003)
2869	Industrial organic chemicals, nec	11	97,620	222,500	51,414	1,960,603	2,620,397	2584.3%	61.3%
2812	Alkalies and chlorine	5	5,244,353	5,620,951	5,660,497	2,215,976	903,456	-82.8%	21.1%
2821	Plastics materials and resins	3	0	18,111	14,972	14,972	726,196	NA	17.0%

Exhibit 4.109 shows how hexachlorobenzene was managed by the 19 facilities in the 3 industry sectors in 2003. Almost 100 percent of the hexachlorobenzene reported by facilities in SIC 2869 (Industrial organic chemicals, nec) and SIC 2821 (Plastics materials and resins) was treated, primarily onsite. Facilities in SIC 2812 (Alkalies and chlorine) also used treatment for about 67 percent of their hexachlorobenzene but also used onsite energy recovery for the other 33 percent

of hexachlorobenzene. A notable quantity of hexachlorobenzene was recycled by facilities in SIC 2821.

Exhibit 4. 109. Management of Hexachlorobenzene in Industry Sectors (SIC Codes) with 99 Percent of Total Quantity (2003)

Primary SIC Code	SIC Description	Total Priority Chemical Quantity	Onsite Disposal	Offsite Disposal	Onsite Energy Recovery	Offsite Energy Recovery	Onsite Treatment	Offsite Treatment	Onsite Recycling	Offsite Recycling
2869	Industrial organic chemicals, nec	2,620,397	33	4,100	0	0	2,605,474	10,789	0	0
2812	Alkalies and chlorine	903,456	6	2	299,735	1	603,199	512	0	0
2821	Plastics materials and resins	726,196	454	1	16	0	712,169	13,557	393,716	0

Recycling. Exhibit 4.110 provides some indication of the extent to which facilities in certain industry sectors recycled at least 100 pounds of hexachlorobenzene in 1999-2003, rather than manage it as a waste. For those year(s), the facility did not report a PC quantity, i.e., a quantity managed via land disposal, energy recovery, or treatment.

Exhibit 4. 110. Facilities reporting Recycling but not a PC quantity (1999-2003)

			1999		2000		2001		2002		2003	
Number of Facilities	EPA Region	State	Onsite Recycle	Offsite Recycle	Onsite Recycle	Offsite Recycle	Onsite Recycle	Offsite Recycle	Onsite Recycle	Offsite Recycle	Onsite Recycle	Offsite Recycle
SIC 2819 -- Industrial inorganic chemicals, nec												
2	8	Colorado	0	0	0	900	0	0	0	0	0	1,237